AN INVESTIGATION INTO THE DIFFERENTIAL PERFORMANCE OF PUPILS ON DIFFERENT OBJECTIVES IN OPEN-BOOK EXAMINATION.

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CHAPTER - I.

INTRODUCTION

A. SOURCE AND STATEMENT OF THE PROBLEM

Everytime at the time of examinations, the problem of cheating in examination-halls pinches us, but no practicable solution to this problem has been found so far.

A few years back Dr. Harper[1] suggested a remedy for the mass-copying. But then no remedy was suggested for copying from books and note-books etc. From this the idea of open-book examination occurred to the investigator. But about the open-book examinations certain doubts were expressed. The present study

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[1] Harper, A.Edwin-Jr., Mass Copying- A Remedy, Teacher Education, IV-1, Jan.,1960, pp.37-38.

is based on these doubts expressed by teachers and others about the open book-examination. These were :

1. Do all the students score uniformly high marks on different objectives in open-book examination ?

2. Do the students with varying levels of achievement perform differently on different objectives in open-book examination ?

3. Do the questions based on different objectives, namely, knowledge, Understanding and Application, discriminate between high and low achievers ?

4. If so, do the questions based on different objectives discriminate equally or different objectives discriminate differently ? and

5. If the different objectives discriminate differently, which objective is most discriminative ?

The present study is, therefore undertaken to find the answers to these doubts expressed by teachers and others.

B. SCOPE AND DELIMITATIONS OF THE STUDY.

If open-book examinations are really very useful,

why are they then not introduced ? It is, probably because substantial research evidences on the open-book examinations are not available to support their introduction in regular routine manner. They will, therefore need to stand some tests the first one probably will be their power to discriminate between high and low achievers. If the conclusion of the investigator would reveal that they do so educators will not hesitate accepting, advocating and implementing them.

In fact this study could be made on different objectives in different subjects and in different classes. But because of the limitation of the time factor, the study is conducted only on the students of science group studying in Class X of Delhi Board in three different schools, and only one question paper of Mathematics-B (Geometry) on the syllabus for class IX was administered. Hence it is better not to generalise these results for other subjects and for other classes.

The present study covers only the three objectives of cognitive domain, namely, Knowledge, Understanding and Application. The same study can also be made on other objectives, e.g. those as propounded by Bloom[2].

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[2] Bloom, Benjamin S.(Ed.), Taxonomy of Educational Objectives, Hand-book I : Cognitive Domain, New York: David McKay Co. Inc., 1956.

C. REVIEW OF RELATED LITERATURE:

In one study Stalnakers[3] split the final examination into a three-hour morning open-book session and a three-hour after-noon closed-book session and compared the relativestanding of the students of the two types of examinations. In general they found

> " .... the relative standing did not change and that both types of examinations gave results similarly related to the scores on an intelligence test. This means that the open-book gave neither more nor less advantage to the more intelligent student than did the closed-book examination."[4]

This shows that the questions set for both the question-papers tested the same abilities other than memory to a great extent. These findings further suggest that relative standing on these two tests did not differ much and this does not discourage the idea of adopting the system of open-book examination.

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3. Stalnaker, John M. and Stalnaker, Ruth C., " Open Book Examinations: Result", Journal of Higher Education, 1935, 6, pp. 214-216 (noted from Reference 4 below).

4. Remmers, H.H. and Gage, N.L., Educational Measurement and Evaluation, New York: Harper and Brothers, Revised Edition, 1955, p. 557.

> to certain students than to others, and the belief that there is no difference between the types of examinations is of dubious nature."[6]

He further discovered that there is no difference in number of errors on the open-book examination between groups of students who rate open-book examinations as being helpful and those who rate them as being not helpful. He also concluded that

> ".....the two types of examinations measure significantly different abilities."[7]

Tussing[8] concluded in favour of open-book examinations. Feldhusen also evaluated the college students' reactions to open-book examinations and found it favouring the open-book examination at a very high level of significance.

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[6] Ibid, p. 203.
[7] Ibid, p. 203

[8] Tussing, Lyle., A Consideration of the Open-Book Examination, Educational and Psychological Measurement 11, 4, 1951, pp. 597-602.

[9] Feldhusen, John F., An Evaluation of College Students& Reactions to Open-Book Examinations, Educational and Psychological Measurement, 21, 3, pp. 637-46.

CHAPTER II.

METHODOLOGY AND PROCEDURE.

A. DESCRIPTION OF THE EXPERIMENT.

THE present study is designed to study the differential performance of the pupils of upper and lower group on the questions based on the objectives of knowledge, understanding and Application in an open-book examination, and thus to find the questions based on which objective are most discriminative in an open-book examination. The objective is to find that the questions based on which objective should be set in the open-book examinations.

B. HYPOTHESES

The null hypotheses for the said study may be stated as under :

1. In an open-book examination the mean scores of pupils on different objectives (namely, Knowledge, Understanding and Application) are equal,

Symbolically,*

$M_k = M_u = M_a$

2. In an open-book examination the mean scores of high group, middle group and low group on questions based on the objective of Knowledge, Understanding and Application are equal

symbolically,

$M_{hk} = M_{mk} = M_{lk}$,

$M_{hu} = M_{mu} = M_{lu}$, and

$M_{ha} = M_{ma} = M_{la}$, and

3. In an open-book examination, questions testing different objectives discriminate equally between high and low achievers,

symbolically,

$M_{hk} - M_{lk} = M_{hu} - M_{lu} = M_{ha} - M_{la}$

C. SAMPLE

1. The subjects of this experiment were students who passed class IX examination of their schools in the year 1967 and were at present studying in Class X of the same school.

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* For key to different abbreviations and symbols see Appendix-A.

2. The school achievement of all the pupils of three different schools of New Delhi studying in Science group of Class X was recorded,

3. The school achievement was based on only three different school tests, namely,

(a) Half-yearly Examination of Class IX, Dec. 1966;

(b) Annual Examination of Class IX, April 1967, and

(c) Half Yearly Examination of Class X, December 1967.

4. The school achievement was based on the paper Mathematics-B (that is, Geometry) only.

5. The open-book test was conducted on all these pupils.

6. In all there were only 180 such pupils whose all the required records (i.e., scores on the three school tests and the scores on the open-book test) was available.

7. Out of these first fifty pupils in order of merit formed the upper group, and the last fifty pupils in order of merit formed the lower group.

D. COLLECTION OF DATA :

1. Tools used for the collection of Data :-

For the collection of data the following two tools were used, namely,

(a) The school Achievement; and

(b) Scores of the Open-Book Test, constructed and administered by the investigator.

2. Description of the Tools :

The tools are described briefly in the following lines :

(a) THE SCHOOL ACHIEVEMENT:

The scores of pupils of these three schools (see Appendix-B) in three different school tests in Geometry were collected and converted into the standard scores (z-scores). The standard scores of these three tests were combined to form the composite z-scores and on the basis of these composite z-scores all the pupils of the three schools were thus ranked in order of their achievement. The first fifty out of 180 pupils (27.77%) formed the 'upper' group (H group) and the last fifty pupils formed the 'lower' group ('L'group).

(b) THE OPEN-BOOK TEST:

The other tool used for the purpose was the question-paper to be administered with books and notes etc. permitted to be used by the examinees in the examination-hall. It consisted of two parts. The form of the questions in Part-I was multiple-choice and in Part-II was short-answer. The number of questions testing different objectives in each part of the test is shown in Table-I below :

TABLE- I.

Number of Questions Testing Different Objectives in Part -I and Part II of the Open-Book Test.

Part of the Test.	Objective Form of Questions.	Knowledge	Understanding.	Application.	Total
I	Multiple Choice	9	11	9	29
II	Short Answer	6	6	7	19

The time allowed for Part-I was 45 minutes and there were four choices in every multiple choice of question out of which only one was correct. The time allowed for Part-II of the test was one hour and twenty minutes.

The questions were set from the syllabus of Geometry prescribed for class IX for the session 1966-67, out of which that portion was deleted which could not be taught in ninth class in one or more classes of the said three schools. The syllabus is given in the second half of the Appendix-C.

The objectives tested by these questions were judged by seven judges - 2 experts from the Department of

Curriculum and Evaluation and 5 secondary school teachers of Mathematics.

3. Directions given to the Subjects:

For administering the Open-Book Test, the subjects were given two types of instructions at two different times, namely,

(a) Instructions to the subjects given one weak before the administration of the test.(For details see Appendix-C)

(b) Instructions to the subjects at the time of the adminstration of the test (For details see Appendix-D).

4. Administration of the Test :

For Part-I of the test a separate answer-sheet (specimen given in Appendix-E) was given which was collected after 45 minutes since the beginning of the test, and for Part-II blank answer-sheets were supplied on which they wrote their answers. In this way the open-book test was administered in three schools on the dates fixed by the respective principals of the schools. The question paper was also taken alongwith the scripts. The test was administered only in one school at a time.

In both the parts of the test there was no case of 'Not Reached'. To some of the examinees some extra time was also allowed, but there were very few such cases.

5. Some Observations:

(a) STUDENTS' REACTIONS:

Students displayed keen interest towards this type of test. Each of them brought a lot of books and note books with them. On the conclusion of the test some of the pupils expressed strong favour for such examination.

(b) Teachers' Reactions :

Teachers of these schools on the whole evinced great interest in this type of examination. Some of them, however, raised doubts regarding the feasibility of such examinations in practice, others thought that all students shall be scoring 100 per cent marks on this type of test, yet some others desired to know whether open-book tests could be held in other subjects also.

In short the interest displayed by both - pupils and teachers - was very encouraging.

6. Scoring of Scripts :

For the scoring of scripts of Part-I of the test, three scoring keys were prepared, one for the questions based on the objective of Knowledge, the second for the questions based on the objective of Understanding, and the third for the questions based on the objective of Application. This ensured correctness of scoring though it took a little more time. In each round the scripts were assessed in a different ink and this facilitated for counting of scores obtained by students on different objectives.

Every correct answer was scored one mark and every wrong answer was scored as zero.

Part-II of the test consisted of the questions of short-answer type. It was assessed with the help of a marking scheme. It was also examined objective-wise in three rounds using different colours of inks for different objectives as in the case of Part-I of the test. For each of the questions of short-answer type there were two marks, so values for different points in terms of marks were allotted. So these answers were scored either zero or 1/2 or 1 or 1½ or 2. In case the total of scores on the questions based on any objective was in fractions, it was changed to next higher integer.

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CHAPTER-III.

TABULATION OF DATA.

HAVING compiled the scores of three school tests of all the students of these three schools, and the scores of these pupils on the open-book examination Part-I and Part-II, the tabulation and analysis of these data is done in the following steps:

A. CONVERSION OF RAW SCORES OF SCHOOL ACHIEVEMENT INTO THE STANDARD SCORES AND THUS TO COMPOSITE STANDARD SCORES:

As the pupils for the 'H' and the 'L' groups were to be selected, their raw scores of school tests were, therefore, converted into the standard scores (z-scores). For this purpose, first of all the means and the standard deviations of the scores of pupils on three tests of these three schools were calculated separately which are shown in TABLE-II.

On the basis of these data the standard scores of these pupils on different tests were calculated with the help of the following formula:[1]

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[1] Guilford, J.P., Fundamental Statistics in Psychology and Education, New York: Mc Graw-Hill Book Company, fourth edition, 1965, p. 128.

TABLE - II.

Maximum marks, Means and Standard Deviations of the Raw Scores of the Pupils of the Three Schools on Three Respective School Tests.

School No.	Test 1	Test 2	Test 3
1. M.M.*	50	60	15
M.	25.08	32.42	6.43
S.D.	11.16	11.90	2.84
N.	98	98	98
2. M.M.	30	60	50
M.	12.16	39.37	24.91
S.D.	5.12	13.33	11.04
N.	44	44	44
3. M.M.	75	60	50
M.	40.90	28.82	21.84
S.D.	20.00	10.75	7.37
N.	38	38	38

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* For the key to abbreviations see Appendix-A.

$$z = \frac{X-M_x}{x}$$

where z stands for the standard score,

X ,, ,, raw score

M_x ,, ,, the mean of raw scores, and

x ,, ,, the standard deviation of raw scores.

In this way the raw scores of all the pupils of these schools on the three school tests were converted into standard scores. The standard scores thus obtained were added together for each pupil to obtain their respective composite scores.

B. SELECTION OF THE BRIGHT AND THE WEAK PUPILS FOR THE 'H' AND THE 'L' GROUPS:

The composite scores thus obtained gave the relative standing of pupils on the basis of school tests in Geometry. They were then arranged in descending order that is, the pupil with highest composite score was placed at the top; the pupil who scored the lowest composite was placed at the bottom.

After arranging the scores of 180 students in this order the top fifty pupils were selected for the upper group or 'H' group and the bottom fifty pupils were selected for the lower group or 'L' group.

C. TABULATION OF SCORES OF THE PUPILS OBTAINED ON THE OPEN BOOK TEST.

The scores of the pupils obtained on the questions

based on the objectives of Knowledge, Understanding and Application on the open-book test were tabulated for Part-I and Part-II separately. Their respective means, standard deviations and variances were also calculated which are shown in the Table-III.

To facilitate comperison these marks were, then, converted to the same maximum marks for each set of questions based on the same objective, that is, to 9 in the case of Part-I and 12 in the case of Part-II. These marks are shown in Table-IV.

D. TABULATION OF SCORES OF THE PUPILS OF THE UPPER AND THE LOWER GROUPS OBTAINED ON THE OPEN-BOOK TEST.

Now the scores of the pupils of the upper and the lower groups obtained on the questions based on the objectives of Knowledge, Understanding and Application on the open-book test were tabulated separately for the two parts of the test. Their means, standard deviations and variances were also calculated which are shown in the Table-V.

As the marks for different sets of questions of each part based on different objectives were different, they were converted to the same maximum marks. The corresponding means, standard deviations, and variances were also then worked out. These are shown in Table-VI.

TABLE-III.

Means scores, Standard Deviations and Variances of 180 pupils on Questions Testing Different Objectives on the Open-Book Test in Geometry.

Part of the Test.	Objective.	M.M.*	M.	S.D.	V.
I (Multi-choice)	Kn	9	5.66	1.414	2.00
	Un	11	6.93	2.29	5.24
	App	9	3.12	1.57	2.46
II (Short Answer)	Kn	12	5.53	4.01	16.08
	Un	12	4.07	3.41	11.61
	App.	14	2.56	2.28	5.20

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* For key to abbreviations see Appendix-B.

Mean Scores, Standard Deviations and Variances of 180 pupils on Questions Testing Different Objectives on the Open-Book Test in Geometory converted to same maximum marks.

Part of the Test.	Objective.	M.M. *	M.	S.D.	V.
I	Kn.	9	5.66	1.414	2.00
(Multi-choice)	Un.	9	5.67	1.87	3.51
	App.	9	3.12	1.57	2.46
II.	Kn.	12	5.53	4.01	16.08
(Short Answer)	Un.	12	4.07	3.41	11.61
	App.	12	2.19	1.95	3.82

* For key to abbreviations see Appendix-A

TABLE - V.

Maximum Marks, Means, Standard Deviations and Variances of the Scores on the Questions testing Knowledge, Understanding and Application of the Pupils of Upper and the Lower Groups obtained in the Open-Book Test (N = 50)

..... Objective Type of•.......... Questions	Group.:		Acquisition of Knowledge	Development of Understanding.	Application of knowledge.
Multi-choice	H*	M.M.	9	11	9
		M.	6.14	7.56	3.72
		S.D.	1.67	2.49	1.40
		V.	2.80	6.20	3.40
	L	M.M.	9	11	9
		M.	5.44	6.80	2.68
		S.D.	1.53	2.15	1.33
		V.	2.33	4.64	1.78
Short Answer	H.	M.M.	12	12	12
		M.	7.94	6.84	4.56
		S.D.	2.33	3.35	2.56
		V.	5.42	11.21	6.56
	L	M.M.	12	12	14
		M.	4.24	6.84	1.04
		S.D.	3.14	2.35	1.02
		V.	9.84	5.54	1.04

* For key to abbreviations, see Appendix-A.

TABLE - VI.

Maximum Marks, Means, Standard Deviations and Variances of the Scores on the Questions Testing the objectives of Knowledge, Understanding and Application of the Upper and the Lower Groups obtained on the open-book test with changed maximum marks (N=50)

Type of questions.	Group.		Acquisition of Knowledge	Development of Understanding.	Application of Knowledge
Multi-Choice	*H.	M.M.	9	9	9
		M.	6.14	6.19	3.72
		S.D.	1.67	2.04	1.84
		V.	2.80	4.16	3.40
	L.	M.M.	9	9	9
		M.	5.44	5.56	2.68
		S.D.	1.525	1.76	1.33
		V.	2.326	3.09	1.78
Short - Answer.	H.	M.M.	12	12	12
		M.	7.94	6.84	2.68
		S.D.	2.33	3.25	2.35
		V.	5.42	11.21	5.54
		M.M.	12	12	12
		M.	4.24	3.91	0.89
		S.D.	3.14	2.19	0.874
		V.	9.86	4,81	0.76

* For Key to abbreviations see appendix - A.

The above conversions were done with the help of statistical formulae. To convert the mean and the S.D. the following two principles were kept in mind. The first is :

> " Let each of N scores be multiplied by a constant amount C. Then the mean of the new set of scores thus formed is equal to the mean of the original set multiplied by this constant amount.
>
> or symbolically,
>
> $M_{cx} = C\bar{X}$ "[2]
>
> and the second is:
>
> " Let each of N Scores be multiplied by a constant amount C. Then the variance of the new set of scores thus formed is equal to the variance of the original set multiplied by the square of this amount.
>
> Or symbolically,
>
> $S^{2}_{cx} = C^{2}X^{2}x$
>
> $S_{cx} = C s_{x}$ "[3]

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*2. Blommers, Paul and Lindquist E.F., Elementary Statistical Methods, Boston: Houghton Mifflin Company 1960, p. 113.

3. Ibid, Pp. 148-9.

CHAPTER - IV.

ANALYSIS AND INTERPRETATION OF DATA

A. ANALYSIS OF DATA FOR THE FIRST HYPOTHESIS:

The data shown in Table-IV will be analysed as shown in Table-VII and Table VIII to see whether the mean scores of sets of questions testing different objectives are the same except for chance errors. Table-VII shows the statistical analysis for Part I of the open-book test, whereas Table VIII shows the same for Part-II of the test.

B. RESULTS OF TABLES VII AND VIII:

1. In Table-VII, it may be seen that in the case of multiple-choice type of questions, the mean score of pupils on the questions testing Knowledge or Understanding is 5.66/9 or about 63 %, whereas on the questions testing Application is only 3.12/9 or hardly 35%.

TABLE - VII.

Significance of Difference Between Mean Scores of 180 pupils on Three Different sets of Multiple-Choice Type of Questions, Each set Testing Different Objective in the Open-Book Test.

M_k (v)	M_u (v)	M_a (v)	r	D	S.E.	t	
5.66 (2)	5.67 (3.51)		.552	-0.01	.120	-0.083	NS*
5.66 (2)		3.12 (2.46)	.469	2.54	.115	21.2	HS**
	5.67 (3.51)	3.12 (2.46)	.444	2.55	.137	18.61	HS**

* Not Significant.

** Highly significant, much beyond .01 level.

TABLE VIII

Significance of Difference Between Mean Scores of 180 Pupils on Three Different Sets of Short-Answer Type of Questions, Each Set Testing DIFFERENT OBJECTIVE IN THE OPEN BOOK TEST.

M_k (v)	M_u (v)	M_a (v)	r	D	S.E.	t	
5.53 (16.08)	4.07 (11.61)		.620	1.46	.245	5.96	HS*
5.53 (16.08)		2.19 3.82)	.572	3.34	.246	13.58	HS
	4.07 (11.61)	2.19 (3.82)	.572	1.88	.208	9.04	HS

---

* Highly significant, much beyond .01 level.

2. The data reveals that in an open-book examination, in the case of multiple-choice type of questions, differance between the mean scores on the objectives of

a. Knowledge and Understanding is not significant.

b. Knowledge and Application is highly significant, i.e. much beyond the level .01,

c. Understanding and Application is again highly significant,

d. Knowledge and Application is more significant than any of the other pairs of objectives.

3. In table VIII, it may very well be noted that in an open-book examination, in the case of short-answer type questions, the mean score of pupils on the questions testing

a. Knowledge is 5.53/12 or about 46 percent,

b. Understanding is 4.07/12 or about 34 per cent,

c. Application is 2.19/12 or about 18 per cent,

4. It may also be noted that in an open-book examination, in the case of short-answer type questions, the difference between the mean scores on the objectives of

a. Knowledge and Understanding,

b. Knowledge and Application, and

c. Understanding and Application,

is highly significant, i.e., much beyond the .01 level,

d. Knowledge and Application is more significant than any of other pairs of objectives.

C. INTERPRETATION OF RESULTS OF TABLES VII AND VIII:

1. In the case of multiple-choice type of questions, it may therefore be said that in open-book examinations pupils are very likely to score high percentage of marks (Mean about 63%) on questions testing Knowledge or Understanding, but in the case of questions testing Application the likelihood is that pupils would not score high percentage of marks (mean about 35%).

2. In the case of short-answer type of questions, the likelihood is that in open-book examinations pupils will score high but not very high marks (Mean about 46 %) on the questions testing Knowledge, and that the percentage of scores on questions testing Knowledge will be much higher than that on questions testing Understanding or Application, whereas in the case of questions testing Understanding, the mean score cannot be said to be even high (Mean about 34%), but in the case of questions testing Application pupils are very likely to score low marks (mean about 18%).

It will further be noted that in the open-book

examination the mean scores of pupils on different objectives differs significantly from each other in the case of short-answer type of questions, whereas in the case of multiple-choice type of questions, the questions testing Application only differ significantly from questions testing either Knowledge or Understanding, but there is no difference between mean scores of pupils on multiple choice type questions testing Knowledge or Understanding.

D. CONCLUSION FOR THE FIRST HYPOTHESES

Thus it can be said that

1. In an open-book examination, in the case of multiple-choice type questions, pupils' performance does not differ on questions testing, Knowledge or Understanding, and they score very high marks on these objectives but their performance on questions testing Application is significantly different from that on questions testing either Knowledge or Understanding;

2. In an open-book examination, in the case of short-answer type questions, pupils' performance on - - - different objectives is significantly different from each other, scoring highest marks on questions testing Knowledge and lowest marks on questions testing Application, thus confirming the hierarchy of Objectives of Knowledge,

Understanding and Application.

E. ANALYSIS OF DATA FOR THE SECOND HYPOTHESIS:

Mean scores of High, Middle and Low groups on different objectives in Part-I and Part-II of the open-book test are shown in Table-IX. To find whether the mean scores of High, Middle and Low groups differ significantly from each otheranalysis of variance was done for each of the tables X to XV in which all were found significantly at least at .05 level so Student's 't' test was applied for each pair of High, Middle and Low group mean scores in each objective for both the parts of the test. These are shown from Table X to Table XV.

F. RESULTS OF TABLES X TO XV:

From Tables X to XV, it is evident that in an open-book examination :

1. In the case of multiple-choice type questions testing Knowledge, the difference between mean scores of
    a. High and Middle groups is significant at .05 level;
    b. High and Low groups is significant at .05 level,
    c. Middle and Low groups is not significant.

TABLE - IX

Mean Scores and Variances of High, Middle and Low Groups on Different objectives on questions in Part-I and Part II of the Open-Book Test.

Part of the Test.	Objective.	M_h (V)	M_m (V)	M_e (V)
I Multi-Choice.	Kn	6.14 (2.80)	5.49 (1.114)	5.44 (2.326)
	Un	6.19 (4.16)	5.43 (2.79)	5.56 (3.09)
	App	3.72 (3.40)	3.013 (2.011)	2.68 (1.78)
II Short - Answer.	Kn	7.94 (5.42)	4.84 (21.68)	4.24 (9.86)
	Un	6.84 (11.21)	3.46 (7.30)	2.68 (5.24)
	App.	3.91 (4.81)	1.94 (1.95)	0.89 (0.76)

For the key to abbreviations, see Appendix-A.

TABLE - X.

Significance of Difference between Mean Scores of Upper, Middle and Lower Groups in Multiple-choice type Questions testing Knowledge

M_h (V)	M_m (V)	M_b (V)	D	S.E.	t	Significant at the level of
6.14 (2.80)	5.49 (1.114)		0.65	.267	2.43	.05
6.14 (2.80)		5.44 (2.326)	0.70	.3234	2.16	.05
	5.49 (1.114)	5.44 (2.326)	0.05	.119	0.42	NS

For key to abbreviations, see Appendix-A.

TABLE - XI

Significance of Difference between Mean Scores of Upper, Middle and Lower Groups in Multiple-Choice type Questions testing Understanding.

M_h (V)	M_m (V)	M_b (V)	D	S.E.	t	Significant at the level of
6.19 (4.16)	5.43 (2.79)		0.76	.347	2.19	.05
6.19 (4.16)		5.56 (3.09)	0.63	.385	1.64	NS
	5.43 (2.79)	5.56 (3.09)	-0.13	.314	-0.414	NS

For key to abbreviations, see Appendix-A.

TABLE-XII.

Significance of Difference between Mean Scores of Upper, Middle and Lower Groups in Multiple-Choice type Questions testing Application.

M_h (V)	M_m (V)	M_l (V)	D	S.E.	t	Significant at the level of
3.72 (3.40)	3.013 (2.011)		0.707	0.308	2.30	.05
3.72 (3.40)		2.68 (1.78)	1.04	0.325	3.20	.01
	3.013 (2.011)	2.68 (1.78)	0.333	0.249	1.34	NS

For Key to abbreviations, see Appendix-A.

TABLE - XIII

Significance of Difference between Mean Scores of Upper, Middle and Lower Groups in Short-Answer type Questions testing Knowledge.

M_h (V)	M_m (V)	M_l (V)	D	S.E.	t	Significant on the level of
7.94 (5.42)	4.84 (21.68)		3.10	.621	4.99	beyond .01
7.94 (5.42)		4.24 (9.86)	3.70	.558	6.63	beyond .01
	4.84 (21.68)	4.24 (9.86)	0.60	.690	0.87	NS

For key to abbreviations, see Appendix-A.

TABLE- XIV.

Significance of Difference between Mean Scores of Upper, Middle and Lower groups in Short Answer type Questions testing Understanding.

M_h (V)	M_m (V)	M_l (V)	D	S.E.	t	Significant at the level of
6.84 (11.21)	3.46 (7.296)		3.38	0.567	5.96	Beyond .01
6.84 (11.21)		2.68 (5.24)	4.16	0.579	7.18	Beyond .01
	3.46 (7.296)	2.68 (5.24)	0.78	0.446	1.75	NS

For key to abbreviations, see Appendix-A.

TABLE - XV.

Significance of Difference between Mean Scores of Upper, Middle and Lower groups in Short-Answer type Questions testing Application.

M_h (V)	M_m (V)	M_l (V)	D	S.E.	t	Significant at the level of
3.91 (4.81)	1.94 (1.95)		1.97	0.350	5.63	HS Beyond .01
3.91 (4.81)		0.89 (0.764)	3.02	0.337	8.96	HS Beyond .01
	1.94 (1.95)	0.89 (0.764)	1.05	0.201	~~0x201~~ 5.22	~~5x22~~ HS Beyond .01

For key to abbreviations, See Appendix-A.

2. in the case of *multiple-choice* type of questions testing *Understanding*, the difference between mean scores of

   a. High and Middle groups is significant at .05 level,
   b. High & Low groups is not significant,
   c. Middle and Low groups is also not significant.

3. in the case of *multiple-choice* type of questions testing *Application*, the difference between mean scores of

   a. High and Middle groups is significant at .05 level,
   b. High and Low groups is significant at .01 level;
   c. Middle and Low groups is not significant.

4. in the case of *short-answer* type of questions testing *Knowledge*, the ~~i~~ difference between mean scores of

   a. High and Middle groups is highly significant (i.e. much beyond .01 level);
   b. High and Low groups is highly significant;
   c. Middle and Low groups is not significant.

5. in the case of *short-answer* type of questions

testing Understanding, the difference between mean scores of

a. High and Middle groups is highly significant;
b. High and Low groups is also highly significant;
c. Middle and Low groups is not significant.

6. in the case of short-answer type of questions testing Application, the difference between mean scores of

a. High and Middle groups is highly significant;
b. High and Low groups is highly significant;
c. Middle and Low groups is also highly significant;

G. INTERPRETATION OF RESULTS OF TABLES X TO XV:

(1) In the case of multiple-choice type of questions in an open-book examinations testing

(a) Knowledge, it may be said that the probabilityis more than .95 that pupils of High group will score more than the pupils of Middle group. The same is the case for the pupils of High group in comparison to the pupils of Low group, but the questions testing Knowledge do not differentiate or discriminate between the pupils of Middle and Low groups;

(b) Understanding, The chances are 95 out of 100 that the pupils of High group will score higher than the pupils of Middle group, but the questions testing Understanding

do not differentiate the pupils of Low groups from either Middle group or High group significantly.

(c) Application, the probability is .95 that the pupils of High group will score higher marks than the pupils of Middle group, and it can be said that the probability is more than .99 that the pupils of High group will score higher marks than those of Lower group, but these questions do not differentiate or discriminate significantly between the pupils of Middle and Low groups.

(2) In the case of Short-answer type of questions in open-book examinations testing

(a) Knowledge, the chances are much more than 99 per cent that the pupils of High group will score higher marks than the pupils of the Middle or Lower group, but pupils of Middle and Lower groups will not be discriminated significantly from each other;

(b) Understanding, the probability is much more than .99, that the pupils of High group will score higher marks than the pupils of the Middle or Lower group, but it is very likely that it will not discriminate significantly between the pupils of Middle and Lower groups;

(c) Application, the probability is more than .99, that the pupils of High group will score significantly higher marks than those of Middle or Lower groups, and

pupils of Middle group will also be significantly discriminated from those of low group. In other words it can be said that the chances are much more than 99 out of 100 that such type of questions are most discriminative.

H. CONCLUSION FOR THE SECOND HYPOTHESIS:

In short it can be said that in an open-book examination

1. in the case of multiple-choice type of questions the chances are greatest in the case of questions testing Understanding that pupils with varying levels of ability will not differ significantly from each other, whereas the probability is less than .05 in the case of questions testing Application that pupils with varying levels of ability will not differ significantly (except in the case of pupils of Middle from Low group) from each other;

2. in the case of short-answer type of questions, it is very likely that the pupils of Middle and Lower groups will not differ significantly from each other on the questions testing Knowledge or Understanding, but the pupils of High group will score significantly higher marks than those of Middle and Lower groups on these objectives, whereas the probability is much less than .01 in the case of questions testing Application that pupils with varying levels of ability will not differ

significantly from each other.

In other words,

" Short-answer type of questions testing Application are most discriminative of all the objectives".

I. ANALYSIS OF DATA FOR THE THIRD HYPOTHESIS:

The simplest index for discrimination is the difference p_u-p_l, where p_u and p_l are marks obtained divided by maximum marks for the upper and the lower groups respectively. Lawshe[1] has given a better index zu-zl (also called D), where zu and zl are the normal - curve deviates corresponding to p_u and p_l.

The proportions and standard deviations of Upper and Lower groups are shown in Table-XVI and Lawshe's Ds are shown in Table-XVII.

J. RESULTS OF TABLE-XVII:

From Table-XVII it is evident that in open-book examinations Lawshe's discrimination index

1. in the case of multiple-choice type of questions testing
   a. Knowledge, is .377
   b. Understanding, is .223
   c. Application, is .939; and

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[1] Lawshe,C.H.Jr. as quoted in Guilford,J.P. Psychometric Methods, Tokyo: Kogakusha Company,Ltd.International Student Edition,Second Edition,1954, Pp.425.

TABLE - XVI.

Proportions of marks and Standard Deviations of Scores of Pupils of the High and the Low Groups on Questions Testing Different Objectives in Multiple-choice and Short Answer type of questions in the Open-Book Test.

Type of Qns.	Group	Objective	Kn.	Un.	App;
Multi-Choice.	H	P.	.682	.688	.413
		S.D.	.186	.228	.204
	L	P.	.605	.618	.298
		S.D.	.170	.196	.148
Short-Ans.	H	P.	.662	.570	.326
		S.D.7	.194	.271	.183
	L.	P.	.353	.223	.074
		S.D.	.262	.196	.073

For Key to abbreviations, see Appendix-A.

TABLE - XVII.

Discrimination (Lawshe's D) of Questions based on Different Objectives of Multiple-choice and short-answer type of Questions in Open-Book Test.

Type of Qns.	Objective.	Pu*	P_l	zu	zl	D or zu - zl	Remarks.
Multi-choice.	Kn.	.682	.605	0.995	0.618	.377	
	Un.	.688	.618	0.825	0.602	.223	Least Discriminative.
	App.	.413	.298	-0.426	-1.365	.939	Most Discriminative.
Short Answer.	Kn	.662	.353	0.835	-0.561	1.396	Least Discriminative.
	Un.	.570	.223	0.258	-1.413	1.671	
	App.	.326	.074	-0.951	-5.836	4.885	Most Discriminative.

For key to abbreviations, see Appendix-A.

2. in the case of short-answer questions testing

   a. Knowledge, is 1.396

   b. Understanding, is 1.671

   c. Application, is 4.885

K. INTERPRETATION OF RESULTS OF TABLE-XVII.

From Table-XVII it is evident that in an open-book examination

1. the multiple-choice type of questions testing
   - a. Understanding are least discriminative
   - b. Application are most discriminative.
2. the short-answer type of questions testing
   - a. Knowledge are least discriminative,
   - b. Application are most discriminative,

in comparison to other objectives.

L. STATISTICAL ANALYSIS FOR THE THIRD HYPOTHESIS WITH THE HELP OF 't' TEST.

Normally, the difference between the mean scores of the Upper and the Lower group are taken as the rough measure of discrimination. But in such cases the variability of scores is not given any importance. In fact the variability also plays a significant role. Hence to find low distant the mean scores of the upper and the lower group from each other are, we shall measure

this distance in terms of the units of the normal-deviate. The greater this difference is, the more discriminative the question or set of questions will be.

These distances between the mean scores of the upper and the lower group in terms of the units of normal deviate are shown in Table-XVIII.

The standard error of the difference between mean scores of the H group and the L group is calculated with the help of the following formula:[2]

$$S^2_{\bar{x}_1-\bar{x}_2} = \frac{S_1^2}{N_1} + \frac{S_2^2}{N_2}$$

where $N_1 = N_2 = N$

$$\text{S.E. or } S_{\bar{x}_1-\bar{x}_2} = \sqrt{\frac{S_1^2 + S_2^2}{N}}$$

M. RESULTS OF TABLE-XVIII:

From Table-XVIII it is evident that in an open-book examination the distance (in terms of units of the normal-deviate) between the mean scores of pupils of the High and the Low groups

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[2] Walker, Helen M., and Lev Joseph, Statistical Inference, Calcutta: Oxford and IBH Publishing Co., First Indian Edition, 1965, p. 157

TABLE - XVIII

Calculation of the Distance between the Mean Scores of the Upper and the Lower groups in units of the normal-deviate for each set of questions based on separate objectives for both the type of questions- Multiple choice and Short-Answer.

Group	Objective.	Multiple-Choice Question.			Short-Answer Questions		
		Kn.	Un	App	Kn	Un	App
H	M	6.14	6.19	3.72	7.94	6.84	3.91
	(V)	(2.80)	(4.16)	(3.40)	(5.42)	(11.21)	(4.81)
L	M	5.44	5.56	2.68	4.24	2.68	0.89
	(V)	(2.326)	(3.09)	(1.78)	(9.86)	(5.54)	(0.764)
D		0.70	0.63	1.04	3.70	4.16	3.02
S.E.		0.3234	0.3847	0.3250	0.5584	0.5847	0.3370
't' (D/SE.		2.16	1.64	3.20	6.63	7.11	8.96
Remarks,			Least Discriminative.	Most Discriminative.	Least Discriminative.		Most Discriminative.

For key to abbreviations, see Appendix-A.

1. in case of multiple-choice type of questions testing

a. Knowledge is 2.16

b. Understanding is 1.64

c. Application is 3.20

and

2. in case of short-answer type of questions testing

a. Knowledge is 6.63

b. Understanding is 7.11

c. Application is 8.96

N. INTERPRETATION OF RESULTS OF TABLE XVIII:

From Table XVIII it is evident that in an open-book examination

1. the multiple-choice type of questions testing

a. Understanding are least discriminative,

b. Application are most discriminative,

2. the short-answer type of questions testing

a. Knowledge are least discriminative,

b. Application are most discriminative in comparison to other objectives.

It can also be inferred that in an open-book examination short-answer type of questions are more

discriminative than multiple-choice type of questions.

O. DISCRIMINATION WITH THE HELP OF COMPARING MEAN SCORES OF PUPILS WITH VARYING LEVEL OF ABILITY:

For comparing the mean scores of pupils of High, Middle and Low groups, the results of Tables X to XV are shown in Table-XIX.

P. INTERPRETATION OF TABLE-XIX.

We know that greater the difference between mean scores of pupils with varying level of abilities on any test, the more discriminative that test will be.

From Table XIX, it is obvious that in an open-book examination

1. the multiple-choice type of questions testing
   a. Understanding are least discriminative,
   b. Application are most discriminative,

2. the short-answer type of questions testing
   a. Knowledge are least discriminative,
   b. Application are most discriminative in comparison to other objectives.

TABLE - XIX

Discrimination by sets of questions testing separate objectives in two types of questions with the help of 't' test on difference between mean scores of different groups.

Type of questions.	Objective.	M_h	M_m	M_l	't'	Level of significance	Remarks
Multi-Choice.	Kn	6.14	5.49		2.43	.05	One NS and no .01
		6.14		5.44	2.16	.05	
			5.49	5.44	0.42	NS	
	Un	6.19	5.43		2.19	.05	Two NS, hence least discriminative.
		6.19		5.56	1.64	NS	
		~~5.43~~	~~5.56~~	~~-0.414~~			
			5.43	5.56	-0.414	NS	
	App.	3.72	3.013		2.30	.05	One NS, and one .01, hence most discriminative.
		3.72		2.68	3.20	.01	
			3.013	2.68	1.34	NS	
Short-Answer.	Kn	7.94	4.84		4.99	.01	One NS, with least t's, hence least discriminative.
		7.94		4.24	6.63	.01	
			4.84	4.24	0.87	NS	
	Un	6.84	3.46		5.96	.01	One NS, but its 't' values are greater than that of Knowledge.
		6.84		2.68	7.18	.01	
			3.46	2.68	1.75	NS	

Contd...........51)

	3.91	1.94		5.63	.01	All significant at .01 level, hence most discriminative.
App	3.91		0.89	8.96	.01	
		1.94	0.89	5.22	.01	

For Abbreviations, see Appendix-B.A.

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Q. DISCRIMINATION WITH THE HELP OF COEFFICIENT OF CORRELATION:

The discrimination of different levels of achievers by questions testing, different objectives can be compared by their respective coefficients of correlation with the criterion scores (composite scores on the basis of three school tests). The higher the coefficient of correlation of a test with the criterion, the greater the discrimination of the test or test item is; for higher coefficient of correlation of a test or test item (than any other test) with the criterion means that the relative standing of pupils on that test (than the other test) bears greater similarity to that on the criterion test.

Again,

> " The validity of an item is essentially the discriminating power of the right answer,... the resulting coefficient dan be regarded as indicating the discriminating power or validity of the particular answer that is keyed as correct..... Thus the correlation coefficient of each alternative whether right or wrong, with the criterion may be obtained."[3]

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[3] Wood, Dorothy Adkins, Test Construction - Development and Interpretation of Achievement Tests, Columbus,Ohio: Charles E.Merrill Books, Inc. 1961, p.87.

The significance of difference between these coefficients of correlation is also calculated and is shown in Table-XXI. Here the 't' test was applied. The formula[4] used for it was :

$$t = (V_{xz}-V_{yz})\sqrt{\frac{(N-3)(1+rxy)}{2(1-r^2_{xy}-r^2_{xz}-r^2_{yz}-2r_{zy}r_{xz}r_{yz})}}$$

R. RESULTS OF TABLES XX AND XXI

It is evident from Table XX that all the coefficients of correlation are significant at .01 level. The significance of difference between these coefficients of correlation is also given in Table XXI.

From Table XXI, it is evident that

1. in the case of multiple-choice type of questions in open-book examination, the coefficients of correlation of criterion with questions testing Knowledge as well as Understanding are not significantly different from each other; in other words it is very likely that the observed difference between these two coefficients of correlation may be due to chance, whereas the probability of this is much more than .99 that r_{xa} is higher than either r_{xk} or r_{xu}; and

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[4] Walker, Helen M., and Lev Joseph, Op. Cit. p.257

TABLE - XXI

Significance of Difference between Coefficients of Correlation of Criterion Scores (X) with scores on Different Open-Book Sets of Questions Each Testing Separate Objective.

Type of Question	r_{xk}	r_{xu}	r_{xa}	t	Level of significance.
Multiple-Choice.	.29	.38	-	1.38	NS
	.29	-	.70	7.43	.01
	-	.38	.70	5.68	.01
Short-Answer.	.41	.54		2.37	.05
	.41		.68	5.30	.01
		.54	.68	2.84	.01

For key to abbreviations see Appendix-A .

2. In the case of short-answer type of questions in open-book examination the coefficients of correlation between Knowledge and Understanding with the criterion is significant at .05, whereas the probability is more than .99 that r_{xa} is higher than either r_{xk} or r_{xu}.

S. INTERPRETATION OF TABLE XX.

Table XX shows that all the coefficients of correlation of these tests testing separate objectives with the criterion are positive, that is, the relative standing of pupils on all these sets of questions in the open-book test is in the same direction as it is on the criterion test, but the extent of this relative standing differs from one set of questions to another. In other words the set of questions testing Knowledge in the open-book test is found to be least when correlated with the criterion, whereas the set of questions testing Application in the open-book examination bears a high correlation with the criterion in both the type of questions - multiple-choice and short-answer. This shows that in open-book tests more pupils of high group score high marks and more pupils of low group score low marks on questions testing Application than in the case of other objectives. Although this method includes the scores of Middle group also, yet the results are the same when two types of questions - multiple-choice and short answer - are comparėd separately.

Hence

" In open-book examinations questions of both - short-answer and multiple-choice type - testing Application are most discriminative."

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CHAPTER . V.

DISCUSSION, SUMMARY OF CONCLUSIONS AND SUGGESTIONS.

A. DISCUSSION

The present study was an attempt to find whether in an open-book examination

(1) all pupils achieve equal marks on questions testing different objectives,

(2) pupils of varying levels of ability score equal marks on questions testing the same objective,

(3) questions testing different objectives are equally discriminative between good and poor pupils.

On testing these hypotheses it was found that in an open-book examination

1. (a) in the case of multiple-choice type of questions pupils score higher marks on questions testing Knowledge or Understanding, but in the case of Application

it cannot be said so.

The phenomenon also seems logical, because in questions testing Knowledge and to some extent Understanding also, memory plays a significant part whereas critical thinking is tested almost in negligible proportion. But in open-book examinations both types of pupils - bright as well as weak - have equal opportunities to write the answers with the help of books, hence on questions testing knowledge (and to some extent Understanding also) both type of pupils are likely to score equally high marks. But in the case of questions testing Application it is not expected. In these questions the ability of critical thinking, applying the Knowledge in novel situations, solving problems etc is tested which is least helped by books or notes etc. It seems, therefore, but natural that in an open-book examination one will score low marks on questions testing Application in comparison to other questions testing Knowledge or Understanding.

1(b) in the case of short-answer type of questions pupils score high marks on questions testing Knowledge, but in the case of understanding, it cannot be said to be either high or low, whereas in the case of questions testing Application they score low marks. The same argument is true for this as was given in 1(a) above.

Again, pupils score low marks on short-answer type of questions than on the multiple-choice type of questions. This too seems natural, just because guessing and copying are common phenomena associated with such (multiple-choice type etc.) tests and do operate in some measure inspite of the checks that we may plan and apply.

It is also observed that pupils score lower marks on questions testing Application. This too seems natural; firstly because their preparation for the examination is according to the traditional examinations which do not emphasise the questions testing Application, and secondly because the questions testing Application require different study habits which these pupils have not acquired.

2. Pupils with varying levels of ability score according to their ability only in the case of short-answer type of questions testing Application. In other cases there is at least one group which does not differ significantly from one or more groups. It is so because the multiple-choice type of questions suffer from more short-comings than short-answer type of questions, and the questions testing the objectives of Knowledge and Understanding are adversely effected in multiple-choice type of questions because of these short-comings.

3. Questions of both type (multiple-choice and short-answer type) testing Application are most discriminative.

Multiple-choice type of questions testing Understanding and of the short-answer type testing Knowledge are least discriminative.

In the case of short-answer type of questions it seems reasonable that questions testing Knowledge are least discriminative and questions testing Application most discriminative. This is probably so because in an open book examination books give ready information and so help in solving questions requiring information whereas their availability does not help better scoring in regard to questions testing higher objectives. In this way it seems logical that the questions testing Application are most discriminative in the open-book examinations.

But in the case of multiple-choice type of questions it is the set of questions testing understanding which is least discriminative, which appears to be against the logical facts. But in the case of multiple-choice type of questions one should not wonder if such things happen because some shortcomings are inherited only in fixed response type of questions. Any-how, regarding multiple-choice type of questions it requires further experimentation.

B. Summary of Conclusions :

The conclusions of the study derived may be summarised as below :

1. In an open-book examination

In Multiple-Choice Type of questions pupils are very likely to score	In Short-Answer type of questions pupils are very likely to score
(a) very high marks on questions testing Knowledge or Understanding	(a) high marks on the questions testing Knowledge,
(b) not high (moderate) marks on questions testing Application	(b) Moderate marks on questions testing understanding,
(c) significantly lower marks on questions testing Application than on questions testing Know--ledge or Understanding	(c) low marks on questions testing Application.
(d) nearly equal (or negligibly different) marks on questions testing Knowledge or Understanding.	(d) Significantly lower marks on questions testing Application than on questions testing Knowledge or Understanding
	(e) significantly high marks on questions testing Knowledge than those testing Understanding or Application.
	Hence,
	"In an open-book examination in the case of short-answer type of questions the hierarchy of objectives - Knowledge, Understanding and Application is confirmed."

2. In an open-book examination in the case of

Multiple-Choice type of questions testing	Short-Answer type of questions testing
(a) Knowledge the probability is .95 that pupils of High group will be discriminated from the pupils of Middle as well as Low groups but it is very likely that the pupils of Middle and Low groups are not discriminated ~~fr~~ from each other.	(a) Knowledge and Understanding, pupils of High group will score higher marks than those of Middle or Low groups, but it is very likely that pupils of Middle and Low groups are not differentiated from each other.

(b) Understanding, the probability is .95 that the pupils of H group will score higher marks than those of Low group, but Low group is not discriminated either from Middle or High group.

(c) Application, pupils of High group will score higher than those of Middle or Low group, but the Middle and the Low groups are not discriminated significantly.

(b) Application, pupils of High, Middle and Low groups are significantly discriminated from each other. Thus

"Short-answer type of questions testing Application are most discriminative in comparison to other objectives."

3. In an open-book examination,

the multiple-choice type of questions testing	the short-answer type of questions testing
(a) Understanding are least discriminative	(a) Knowledge are least discriminative
(b) Application are most discriminative	(b) Application are most discriminative.

The order in which the various forms of questions testing different objectives can be placed in order of their ability to discriminate between the pupils of High and Low groups based on Lawshe's D (zu-zl) is shown in Table XXII. The same is also shown on the basis of 't'test in Table XXII.

By comparing Table XXII and XXIII we find the same results. Thus the order in which the various forms of questions testing different objectives can be placed in order of their ability to discriminate between the pupils of High and Low groups is as follows :

TABLE NO. XXII.

Types of Questions testing different objectives placed in order of their ability to discriminate on the basis of Lawshe's D (zu-zl)

S.No.	Form of Question.	Objective tested.	Lawshe's D (zu-zl)	Remarks
1.	Short Answer.	Application	4.835	Most Dis-criminative
2.	Short-Answer.	Understanding.	1.671	
3.	Short Answer.	Knwoledge	1.396	
34.	Multi-choice.	Application	.939	
5.	Multi-Choice.	Knowledge	.377	
6.	Multi-Choice.	Understanding.	.223	Least discriminative.

TABLE- XXIII.

Types of questions testing different objectives placed in order of their ability to discriminate on the basis of 't' test.

S. No.	Form of questions.	Objective tested	't'	Remarks
1.	Short-Answer	Application	8.96	Most discriminative.
2.	Short-Answer	Understanding.	7.11	
3.	Short-Answer	Knowledge	6.63	
4.	Multi-Choice	Application	3.20	
5.	Multi-Choice	Knowledge	2.16	
6.	Multi-Choice	Understanding	1.64	Least discriminative.

i) Short-answer type of questions testing Application (most discriminative),

ii) Short-answer type of questions testing Understanding,

iii) Short-answer type of questions testing Knowledge

iv) Multiple-Choice type of questions testing Application.

v) Multiple-choice type of questions testing Knowledge, and

vi) Multiple-choice type of questions testing Understanding. (Least discriminative)

C. SUGGESTIONS.

As open-book examinations have many good qualities and in many respect they are found to be superior to the prevalent closed-book examinations; for many defects of prevalent closed-book examinations are remedied, it is, therefore suggested that

(1) experimentation on open-book examinations should be undertaken intensively,

(2) in some experimental schools, open-book examinations may be introduced on experimental basis, and its effect may be studied so or to see its feasibility at University or Board Level.

(3) In these open-book examinations, short-answer type of questions testing Application should be set, because these are found to be most discriminative.

D. SUGGESTIONS FOR FURTHER RESEARCH.

The same study may be undertaken on different subjects for different classes and it may be investigated whether open-book examinations are suitable for all subjects and for all classes at different levels.

A similar study may also be undertaken on the open-book examinations to study the pupil performance on all the objectives of cognitive domain as propounded by Bloom[1] namely Knowledge, Comprehension, Application, Analysis, Synthesis and Evaluation.

The effect of open-book examination may also be studied by administering the same question paper (or parallel question paper) in closed-book examination as well as in open-book examination, and in this way it may be studied that the pupils of what level of ability are benefitted most or least in the open book examination.

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[1] Bloom, B.S. op.cit.

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APPENDIX-A.

KEY
TO
ABBREVIATIONS AND SYMBOLS USED IN THE REPORT.

App.	The 'Application' Objective.
C.	A Constant number.
D	Difference between Means.
H	The Upper group or High group.
HS	Highly significant, much beyond the level of .01
Kn.	The 'Knowledge' objective.
L.	The 'Lower' group
Lawshe's D or (zu-zl)	
M	Mean
M_a	Mean Score on questions testing Application.
M_{cx}	Mean of X scores all multiplied by a constant C
M_h	Mean Scores of High group
M_{ha}	Mean score of High group on questions testing Application
M_{hk}	Mean score of High group on questions testing Knowledge
M_{hu}	Mean score of High group on questions testing Understanding.
M_k	Mean score on questions testing Knowledge.
M_l	Mean score of Low group.
M_{la}	Mean score of Low group on questions testing 'Application'
M_{lk}	Mean score of Low group on questions testing (' Knowledge'.

M_{lu}	Mean score of Low group on questions testing 'Understanding'
M.M.	Maximum Marks.
M_m	Mean score of Middle group.
M_{ma}	Mean score of Middle group on questions testing 'Application'
M_{mk}	Mean Score of Middle group on questions testing 'Knowledge'
M_{mu}	Mean score of Middle group on questions testing 'Understanding'
Mul.Choice or Multi-Choice.	Multiple-choice type of questions.
M_u	Mean score on questions testing 'Undersaanding'
M_x	Mean score of raw scores
N	Size of the sample or number of subjects inthe sample.
NS	Not significant.
p	Propertion of scores (marks obtained divided by maximum marks)
p_u	p. of the upper group.
p_l	Proportion of scores of the lower group.
r	Coefficient of correlation
r_{ka}	Coefficient of Correlation between the scores on questions testing Knowledge and Application.
r_{ku}	Coefficient of Correlation between the scores on questions testing Knowledge and Understanding.
r_{ua}	Coefficient of Correlation between the scores on questions testing Understanding and Application.
r_{xa}	Coefficient of correlation between the composite scores based on school tests and scores on questions testing Application
r_{xk}	Coefficient of Correlation between the composite scores based on school tests and scores on questions testing Knowledge.

Coefficient of correlation between the composite scores based on school tests and scores on questions testing Understanding.

Short-answer type of questions,

Standard Deviation of the scores when all the scores are multiplied by a constant C

Standard Deviation,

Standard Error.

Student's t.

The Objective of Understanding.

Variance = $(S.D.)^2$

p_u in units of normal-curve deviate.

p_l in units of normal-curve deviate.

The S.D. of raw scores.

APPENDIX - B.

List of Schools from which the Data is collected.

(1) Government Boys' Higher Secondary School
No. 1, Sarojini Nagar, New Delhi.

(2) Government Boys' Higher Secondary School,
No. 3, Sarojini Nagar, New Delhi,

and

(3) Government Boys Higher Secondary School,
No. 5, Sarojini Nagar, New Delhi.

APPENDIX - C.

Speciman of the instructions to students given one week before the administration of the Open-Book Test.

Part-I consists of instruction in Hindi, and Part-II consists of instructions in English.

Encls :-

(i) Appendix 'C' Part I

(ii)Appendix 'C' Part II.

APPENDIX 'C'

(PART-I)

कक्षा - 10 - गणित, (विज्ञान ग्रुप)

प्रिय विद्यार्थी,

आप को यह जान कर प्रसन्नता होगी कि खुली पुस्तक परीक्षा सम्बन्धी एक नया प्रयोग किया जा रहा है । यह परीक्षा इस बात पर बल देती है कि विद्यार्थियों को परीक्षा - भवन में पुस्तकें, गृहकार्य की कापियां, सहायक पुस्तकें आदि देखने की पूरी छूट होनी चाहिये किन्तु परीक्षा देते समय परीक्षार्थी न तो किसी व्यक्ति से कोई बातचीत ही करे और न ही अन्य परीक्षार्थियों की उत्तर - पुस्तिकाओं से नकल करने का प्रयास करे ।

इस प्रकार की परीक्षा केवल गणित - बी अर्थात् रेखागणित के प्रश्न-पत्र के लिये ही होगी ।

यह प्रसन्नता की बात है कि हमारे प्रधानाचार्य महोदय तथा गणित के अध्यापक महोदय भी इस प्रयोग में गहरी (रूचि) ले रहे हैं और आशा की जाती है कि आप भी इस में अत्यधिक रूचि लेंगे तथा इस ` खुली पुस्तक परीक्षा ` को सफल बनाने में सहयोग देंगे ।

1) परीक्षा के लिये रेखागणित की पाठ्य पुस्तकें, गृहकार्य की कापियां, हल किये हुए प्रश्न एवं अन्य सहायक पुस्तकें आदि आप अपने साथ अवश्य लायें —— परीक्षा के समय पुस्तकों आदि का पूरा - पूरा उपयोग कीजिये ।

2) इस परीक्षा के लिये उत्तर - पुस्तिकायें परीक्षक द्वारा दी जायेंगी ।

3) परीक्षा देते समय कोई परीक्षार्थी किसी दूसरे साथी या व्यक्ति से न तो बात और न ही नकल करने का प्रयास करे, साथ ही किसी को अपनी उत्तर-पुस्तिका से नकल न करने दें।

4) परीक्षा की तिथि - - - - - - - - - - -

5) परीक्षा का समय - - - - - - - - - - -

6) परीक्षा का स्थान: आप का स्कूल

APPENDIX C (II)

The syllabus for the test will be as follows :

Staight lines, Parallel lines, Angles of triangles and quadrilaterals, Pythagoras Theorem, Medians of Triangles, Lines Parallel to the base of the triangles, Theoretical questions on construction of triangles and quadrilaterals (Construction of Triangles and Quadrilaterals will not be required).

Questions asked in the test will be similar to the following examples:

Q.1 Write the serial letter of the correct answer of the following question :

Q.1. The sum of all the three interior angles of a triangle is always

(A) Greater than two right angles.

B. Equal to two right angles.

C. Less than two right angles, but greater than one right angle.

D. Equal to one right angle.

Answer (B)

Q.2. Find the value of angles B,C and D of a parallelogram ABCD, if the value of angle A is 60^o

Ans:

Because Angle C is equal to Angle A (Opposite angles of a parallelogram)

therefore Angle C is equal to 60^o

Because the sum of angle A and Angle B is equal to 180^o

(Adjascent angles of a parallelogram)

therefore angle B is equal to 180°-angle A

or $180^\circ - 60^\circ$

or 120°

therefore, angle D is equal to Angle B

or each of these angles is equal to 120°

therefore the value of Angle B is 120°
Angle C is 60°
and angle D is 120° Answer.

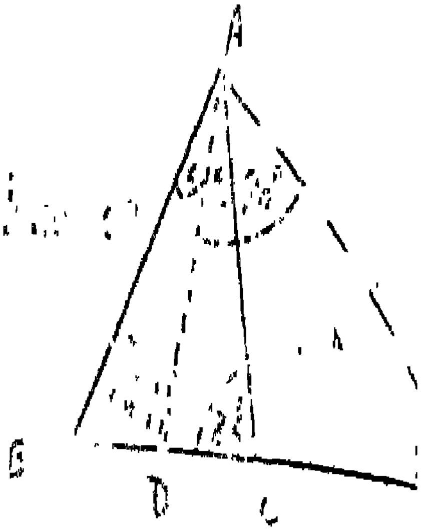
APPENDIX - D.

Specimen of the Question Paper for the Open Book Test,

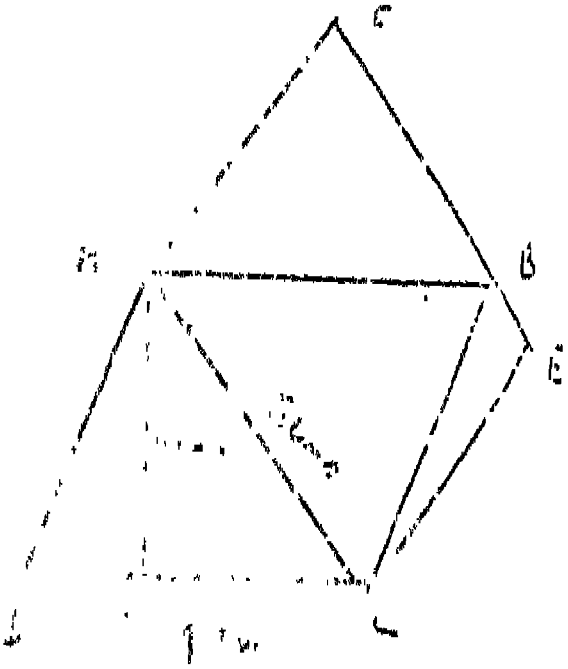
Enclosure :

1. Cyclostyled copy of the Open-Book Test
   in Geometry for Class - X.

49. In the adjacent triangle ABC, angle ABC = 34°, [illegible] AD bisects angle BAC, [illegible]. Find the value of angle [illegible]



50. In the adjoining figure, [illegible] parallelogram [illegible] to CD. ACEF is [illegible] AC is one of its sides [illegible] through B. If [illegible] and AC = [illegible] cms. [illegible]?



APPENDIX-E.

Specimen of the Answer-Sheet for the Part-I of the Open Book Test,

Encls. One Cyclostyled copy
of the Answer-sheet for
Part-I of the Open Book
Test.

ANSWER SHEET FOR PART - I

of the open-Book Examination

R.No................ Name..................Class & Sec.........

Name of the School...

Subject - Mathematics -B (Geometry)..... Date.................

Q.NO.	Answer	Q.No.	Answer	
1.	....	2.	....	
3.	....	4.	....	
5.	....	6.	....	
7.	....	8.	....	
9.	....	10.	....	
11.	....	12.	....	
13.	....	14.	....	
15.	....	16.	....	
17.	....	18.	....	
19.	....	20.	....	
21.	....	22.	....	
23.	....	24.	....	
25.	....	26.	....	
27.	....	28.	....	
29.	....	30.	....	
TOTAL				

APPENDIX - F.

List of Questions testing the Objectives of 'Knowledge' 'Understanding', and 'Application' in Part-I of the Open-Book Test.

	Objective.	Question Numbers.	Total No. of questions in each object.
1.	Knowledge	1, 3, 5, 7, 9, 14, 25, 27 and 29	9
2.	Understanding.	2, 4, 6, 11, 12, 13, 16, 17, 19, 21 and 23	11
3.	Application	8, 10, 18, 20, 22, 24, 26, 28, and 30.	9

Note:- Question No. 15 was deleted.

APPENDIX - G.

List of Questions testing the Objectives of Knowledge, 'Understanding', and 'Application' in Part - II of the Open-Book Test.

	Objective	Question Numbers.	Total No. of questions in each objective
1.	Knowledge	31, 32, 41, 43, 45 and 46.	6
2.	Understanding	33, 35, 36, 37, 39 and 49	6
3.	Application	34, 38, 40, 42, 44 and 48 and 50	7

Note:- Question No. 47 was deleted.

APPENDIX - H.

GLOSSARY OF TECHNICAL TERMS.

The technical terms used are being given with a brief explanation to give the interpretation of different terms followed in the study.

(1) APPLICATION:

"An instructional or learning out-come involving the use of skills, knowledges, concepts and understandings in practical situations."[1]

"The ability to apply principles to new situations'[2] is described as to apply most directly to category Application.[3]

(2) BRIGHT AND WEAK PUPILS, or
GOOD AND POOR PUPILS, or
High and Low group, or
Upper and Lower Group.

"Students in the top 27 per cent on total test score are taken to be 'ggod' students, and those in the bottom 27 per cent on total test score are taken to be 'poor' students."[4]

---

1. Greene, Harry A., Jorganson, Albert N., and Gerberich, J. Raymond, Measurement and Evaluation in the Secondary Schools, New York: Longman's, Green and Co., 1954, p. 650.

2. American Council on Education Studies, " A Design for General Education." as quoted in Bloom, op.cit. p.48

3. Bloom, op.cit., p.48

4. Ebel, R.L., Measuring Educational Achievement, New Delhi Prentice-Hall of India Priate Ltd. 1966, p.301.

3. CHEATING:

"Any activity of a student or group of students whose purpose is to give any of them higher grades than they would be likely to receive on the basis of their own achievements in cheating,"[5] e.g. copying from fellow-examinees' answers, using books, cribs etc in the closed-book examination.

4. CLOSED BOOK EXAMINATION: is a test in which examinees are not permitted to see books or notes etc in the examination hall.

5. DISCRIMINATION INDEX, " is a measure of the extent e to which students who are judged to be good in terms of some standardsucceed on the item and those who are judged to be poor on the same standard fail it. A commonly used index of discrimination is simply the difference in a proportion of correct response between the group of those scoring in the top 27 per cent on the total text and the group scoring in the bottom 27 per cent on the same test."[6]

6. KNOWLEDGE. " An instructional or learning out-come represented by the ability to recall or recognise facts, persons, places or things"[7]

---

[5] Ibid,, p. 209.

[6] Ibid,, p. 349,

[7] Greene, Harry A, et. al., p. 656

7. OBJECTIVE. Behavioural goal, "aim, end in view, or purpose of a course of action or a belief..."[8]

8. Open Book Examination is a test in which examinees are permitted to consult book and notes etc in the examination-hall except that they are not permitted to consult any person.

9. UNDERSTANDING; " An instructional or learning outcome involving comprehension of ~~wha~~ meaning and of the uses and significance of what has been ~~harx~~ learned."[9]

---

8. Good, Carter V.Dictionary of Education, New York: Mc Graw-Hill Book Company Inc. 1959, second Edition p.371.

9. Greene, Harry A., _et.al_. p. 664.

APPENDIX-J.

LIST OF JUDGES WHO JUDGED THE OBJECTIVES OF THE QUESTIONS OF THE OPEN-BOOK TEST.

1. Prof. I.S.Chaudhari,
   Reader, Deptt. of Curriculum and Evaluation,
   National Institute of Education,
   New Delhi.

2. Prof. H.S.Singha,
   Reader, Deptt. of Curriculam and Evaluation,
   National Institute of Education, New Delhi.

3. Shri G.L.Ogra, Lecturer in Mathematics,
   at present, student of
   Associateship Course.

4. Shri K.M.Umapati, -do-

5. Shri K.R.Prasad, -do-

6. Shri M.M.Sharma, -do-

7. Shri M.P.Panduranga, -do-

APPENDIX-K

List of scores of 180 pupils on their schools testsand on sets on questions testing separate objectives in the open -book test.

Student's Code No.	School Achievement			Open-book Test					
	Test 1	Test 2	Test 3	Multiple Choice			Short-Answer		
				Kn	Un	App	Kn	Un	App
MM.	50	60	15	9	11	9	12	12	14
1	2	3	4	5	6	7	8	9	10
1.01	40	38	8	6	3	4	8	3	5
1.02	25	32	0	8	7	2	4	2	4
1.03	23	38	7	6	9	4	9	1	3
1.04	21	21	2	7	9	3	5	0	3
1;05	43	48	11	9	11	7	10	12	9
1.06	20	14	5	7	7	3	4	0	2
1.07	21	37	6	3	3	1	7	5	3
1.08	36	45	7	5	11	4	8	4	4
1.09	44	50	13	7	9	3	10	11	8
1.10	33	40	5	5	11	3	6	0	2
1.11	30	39	3	8	8	2	0	0	2
1.12	22	36	8	7	6	2	4	4	5
1.13	18	17	4	6	9	4	4	0	2
1.14	15	18	4	2	6	2	3	3	0
1.15	35	38	7	4	5	2	4	6	3
1.16	38	39	5	5	8	4	7	0	2
1.17	28	35	5	7	7	3	7	2	2
1.18	41	35	10	8	11	3	11	11	8
1.19	27	23	5	8	6	2	11	6	2
1.20	31	41	7	5	7	2	6	6	5
1.21	37	46	10	7	8	6	9	7	8

3	4	5	6	7	8	9	10
37	4	3	5	0	8	5	5
28	4	5	5	1	4	2	2
33	10	7	9	4	7	4	2
46	10	7	9	4	10	10	10
13	4	4	9	3	9	0	0
36	7	5	6	2	2	0	1
37	6	5	8	3	1	0	2
42	9	5	10	6	12	7	6
28	4	5	11	4	6	0	2
42	9	5	2	3	6	2	4
57	12	9	11	7	10	12	7
26	5	6	9	4	7	5	4
20	9	5	8	3	7	0	0
46	8	7	9	4	4	6	6
40	2	5	6	2	6	2	0
26	8	9	6	4	10	12	2
52	6	7	8	3	10	04	4
27	5	8	8	3	8	5	2
44	5	4	4	2	8	5	6
34	0	7	7	3	2	0	0
24	3	5	7	3	0	0	0
10	5	5	7	3	0	0	0
23	3	6	6	3	1	0	0
35	3	4	4	2	8	4	4
40	2	5	8	2	8	0	0
28	5	8	8	3	10	3	6
42	7	8	9	5	10	5	2

1	2	3	4	5	6	7	8	9	10
1.49	22	45	6	6	8	4	6	2	1
1.50	35	46	9	8	8	5	6	4	6
1.51	20	40	7	6	9	3	8	3	0
1.52	19	21	5	5	8	1	1	0	0
1;53	14	13	6	6	7	3	0	0	0
1.54	28	32	6	8	9	3	6	0	4
1.55	36	38	7	4	8	4	5	4	0
1.56	12	25	5	7	8	4	3	2	0
1.57	10	25	4	5	9	3	0	0	0
1.58	36	53	11	8	9	3	8	8	6
1.59	22	26	4	6	8	3	4	2	0
1.60	48	38	7	4	4	2	7	4	2
1.61	15	14	2	4	4	2	0	46	2
1.62	14	30	2	6	7	3	0	0	0
1.63	9	13	5	8	10	4	7	7	2
1.64	14	18	6	5	3	4	2	4	2
1.65	11	16	4	5	2	4	2	3	0
1.66	4	32	4	5	7	5	3	3	0
1.67	3	15	6	7	10	5	7	6	0
1.68	6	27	9	5	9	4	0	0	0
1.69	13	12	6	5	10	4	2	2	0
1.70	28	35	5	4	4	4	7	0	2
1.71	20	30	10	5	10	3	2	4	2
1.72	20	32	8	5	8	4	4	4	0
1.73	37	43	11	5	9	3	6	6	2
1.74	30	28	9	8	10	5	6	10	4
1.75	49	54	13	8	9	5	8	10	5

3	4	5	6	7	8	9	10
46	8	6	7	5	9	11	0
45	8	6	10	4	10	6	0
41	11	6	7	5	4	7	2
41	12	8	10	5	9	12	4
36	9	4	8	4	10	6	2
39	9	8	9	4	10	10	7
33	5	5	9	3	9	6	2
47	8	5	6	7	8	10	4
16	7	7	8	5	10	8	2
31	10	7	10	4	5	7	2
55	13	8	9	5	10	12	8
24	3	7	7	4	10	7	2
25	7	5	4	4	4	1	0
19	6	5	9	4	8	4	2
31	7	7	9	7	3	4	3
8	3	5	6	2	8	2	0
33	5	8	9	4	5	6	2
41	7	4	8	7	4	10	0
18	5	5	6	2	4	4	0
27	6	5	3	5	4	3	4
9	3	6	6	3	2	0	0
12	6	8	9	6	5	4	0
43	8	9	10	9	10	12	8

30	60	50	9	11	9	12	12	14
2	3	4	5	6	7	8	9	10
26	55	31	6	11	6	10	10	6
11	42	38	7	6	2	8	2	4
24	39	32	7	9	5	6	4	4
12	39	38	5	5	4	6	4	2
8	14	31	5	5	4	4	1	2
8	31	19	5	5	4	6	4	2
7	22	26	4	6	5	5	4	2
6	20	17	7	8	5	5	5	0
11	40	26	4	5	1	6	0	0
12	30	33	5	9	4	12	8	3
13	44	40	5	10	6	12	8	3
16	38	30	7	10	6	11	6	2
12	51	36	6 7	10	5	8	5	4
9	43	27	8 7	8	5	8	3	2
11	58	35	6	7	2	8	6	5
16	49	32	6	8	2	8	8	4
9	38	14	6 7	6	1	10	6	2
8	24	16	7	9	4	2	6	0
6	16	0	7	9	4	2	2	0
7	36	25	7	8	4	5	2	2
13	46	27	7	7	1	6	4	2
7	24	16	5	6	1 4	4	0	
5	11	6	5	9	1	2	4	3
10	48	27	5	2	2	1	2	0
7	44	17	4	6	3	3	4	0

3	4	5	6	7	8	9	10
60	43	7	8	5	12	12	10
52	14	3	6	4	3	2	0
44	13	5	7	4	4	4	2
53	30	7	9	2	9	10	4
17	4	1	4	2	3	1	0
50	33	3	7	3	3	2	2
13	6	4	2	1	1	1	0
54	25	4	3	3	3	0	2
28	7	4	4	1	2	0	0
51	40	6	2	4	6	3	6
44	21	4	3	3	3	2	0
47	19	2	5	2	2	1	2
43	23	2	6	1	2	0	2
52	39	3	4	2	7	4	9
53	41	4	7	1	7	4	4
36	10	4	7	1	5	2	2
47	27	5	6	2	6	4	3
50	24	6	3	4	6	0	3
52	27	3	6	2	1	0	0

60	50	9	11	9	12	12	14
3	4	5	6	7	8	9	10
42	23	6	3	1	8	6	2
28	12	6	9	4	8	6	4
17	21	~~6~~ 7	7	2	4	6	4
21	11	6	3	1	2	4	0
20	13	4	8	2	3	2	2
49	30	7	10	2	6	4	6
20	13	5	9	1	6	3	2
26	29	3	8	0	6	0	4
28	19	2	5	3	6	3	2
38	23	4	5	1	6	8	2
32	10	5.7	3	10	3	5	
23	16	3	5	1	10	2	6
33	31	[illegible] 7	6	2	10	5	6
17	14	5	5	1	4	4	2
43	33	5	4	4	6	4	2
39	21	8	7	3	8	4	3
13	12	5	8	1	8	7	4
56	29	5	6	0	7	8	4
20	12	6	7	1	8	10	4
30	27	6	7	2	9	10	6
12	26	3	3	1	7	3	1
35	24	5	7	1	10	6	6
51	25	7	8	3	6	7	4
18	25	5	5	2	7	4	2
44	32	5	4	2	7	2	0

3	4	5	6	7	8	9	10
23	30	5	3	2	7	2	2
40	39	9	9	3	10	8	4
22	13	8	6	2	12	4	1
31	21	6	6	4	8	4	0
22	19	7	6	4	10	3	2
24	28	6	7	2	12	1	2
23	27	6	3	2	8	5	2
26	8	3	3	1	8	2	2
18	19	4	3	2	2	8	2
29	19	6	2	0	2	2	4
26	27	5	7	2	6	4	4
33	28	6	5	2	8	4	2
23	21	4	3	2	6	0	2

APPENDIX-L

List of Scores of pupils of 'L' group on the Open-book Test.

S. No.	Code No.	Composite scores.	Marks on Open Book Test					
			Multi-choice.			Short-Answer.		
			Kn.	Un.	App.	Kn.	Un.	App.
1	2	3	4	5	6	7	8	9
1.	2.17	-1;734	7	6	1	10	6	2
2.	1.23	-1.773	5	5	1	4	2	2
3.	1.46	-1.826	5	8	2	8	0	0
4.	2.41	-1.857	4	7	1	5	2	2
5.	3.34	-1.90	4	3	2	2	8	2
6.	3.17	-1.92	5	8	1	8	7	4
7.	1.52	-2.009	5	8	1	1	0	0
8.	3.21	-2.02	3	3	1	7	3	1
9.	1.26	-2.047	4	9	3	9	0	0
10.	1.89	-2.272	5	9	3	8	4	2
11.	3.07	-2.28	5	9	1	6	3	2
12.	1.56	-2.300	7	8	4	3	2	0
13.	1.02	-2.306	8	7	2	4	2	4
14.	3.30	-2.33	7	6	4	10	3	2
15.	1.64	-2.356	5	3	4	2	4	2
16.	3.02	-2.370	6	9	4	8	6	4
17.	1.87	-2.371	7	7	4	10	7	2
18;	2.18	-2.499	7	9	4	2	6	0
19.	1.06	-2.507	7	7	3	4	0	2
20.	1.41	-2.586	7	7	3	2	0	0

3	4	5	6	7	8	9
-2.724	6	6	3	1	0	0
-2.757	6	7	3	0	0	0
-2.770	8	9	6	5	4	0
-2.776	6	7	3	0	0	0
-2.780	5	7	5	3	3	0
-2.780	4	8	2	3	2	2
-2.786	6	9	4	4	0	2
-2.831	5	9	3	0	0	0
-2.885	7	9	3	3	0	3
-2.888	5	7	2	4	4~~4~~	0
-2.950	5	10	4	2	2	0
-2.971	2	6	2	3	3	0
-2.995	5	6	1	4	4	0
-3.177	5	7	3	0	0	0
-3.202	5	7	3	0	0	0
-3.26	3	3	1	8	2	2
-3.39	8	6	2	12	4	1
-3.459	5	2	4	2	3	0
-3.510	4	4	~~4~~ 1	2	0	0
-3.577	8	10	4	7	7	2
-3.594	7	10	5	7	6	0
-3.624	7	8	5	5	5	0
-3.630	1	4	2	3	1	0
-4.011	4	4	2	0	6	2
-4.07	6	5	1	4	4	2
-4.335	4	2	1	1	1	0

3	4	5	6	7	8	9
-4.975	6	6	3	2	0	0
-5.240	7	9	4	2	2	0
-5.507	5	6	2	8	2	0
-5.568	5	9	1	2	4	3

APPENDIX-M.

List of scores of pupils of 'H' group on the Open-book Test.

Composite scores.	Marks on Open Book Test					
	Multi-choice.			Short-Answer.		
	Kn.	Un	App.	Kn.	Un.	App.
6.269	8	9	5	8	10	5
5.816	8	9	5	10	12	8
5.812	9	11	7	10	12	7
5.698	7	8	5	12	12	10
5.485	7	9	3	10	11	8
5.203	7	9	4	10	10	10
5.18	5	6	0	7	8	4
4.71	9	9	3	10	8	4
4.524	9	11	7	10	12	9
4.515	5	4	4	6	4	2
4.401	6	11	6	10	10	6
4.317	8	9	3	8	8	6
4.115	6	7	5	4	7	2
3.78	7	8	3	6	7	4
3.743	5	2	4	6	3	6
3.566	5	9	3	6	6	2
3.392	8	10	5	9	12	4
3.466	7	8	6	9	7	8
3.37	7	10	2	6	4	6
3.115	5	6	7	8	10	4

3	4	5	6	7	8	9
2.946	3	4	2	7	4	0
2.936	8	8	5	6	4	6
2.868	5	10	6	12	7	6
2.827	5	10	6	12	8	3
2.813	4	7	1	7	4	4
2.724	4	4	2	7	4	2
2.673	7	9	4	4	6	6
2.421	9	10	9	10	12	8
2.374	7	9	4	7	4	2
2.359	6	3	4	8	3	5
2.348	8	9	4	10	10	7
2.33	5	2	3	6	2	4
2.32	8	7	3	8	4	3
2.24	5	4	2	7	2	0
2.237	5	11	4	8	4	4
2.096	4	8	4	10	6	2
2.087	6	8	2	8	8	4
2.07	6	3	1	8	6	2
2.059	6	7	2	8	65	5
2.058	3	7	3	3	2	2
1.909	7	10	5	8	5	4
1.902	2	5	2	2	1	2
1.900	7	11	3	11	11	8
1.87	7x62	6	2	10	5	6
1.867	6	7	5	9	11	0
1.86	5	7	1	10	6	6
1.70	9	10	6	6	7	1
1.649	4	8	4	5	4	0
1.626	4	3	3	3	2	0
1.620	7	9	2	9	10	4

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